DISSERTATION ON OUTCOME OF POST TRAUMATIC STRICTURE URETHRA

Dissertation submitted for
M.Ch Higher Speciality Degree Examination
Branch IV – UROLOGY

DEPARTMENT OF UROLOGY
KILPAUK MEDICAL COLLEGE & HOSPITAL
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CHENNAI

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CHENNAI

AUGUST-2008

CERTIFICATE

This is to certify that the dissertation titled **"OUTCOME OF POST TRAUMATIC STRICTURE URETHRA- OUR INSTITUTE EXPERIENCE"** is the original work done by **Dr. K.SUBRAMANIYAN**, post graduate in M.Ch., (Urology) at the Department of Urology, Kilpauk Medical College, Chennai-10, to be submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai-32, towards the partial fulfillment of the requirement for the award of M.Ch.., Degree in Urology, August 2008.

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ACKNOLEDGEMENT

My sincere thanks and gratitude to **Prof. M.DHANAPAL. M.D., D.M.,** (Cardiology), Dean, Kilpauk Medical College, for permitting me to utilize the clinical materials of this hospital.

I have great pleasure in thanking my teacher and guide **Prof.K.THIYAGARAJAN, M.Ch., (Urology) D.N.B (Urology)** Professor & Head of the Department, Department of Urology, Kilpauk Medical college and Govt. Royapettah hospital for permitting me to use the clinical material and for his valuable advice and encouragement in preparing this dissertation.

I have great pleasure in thanking my teacher and guide **Prof.V.SELVARAJ, M.Ch., (Urology)**, Additional professor, Department of Urology, Kilpauk medical college for permitting me to use the clinical materials and for valuable advice and encouragement in preparing this dissertation.

I have great pleasure in thanking my teachers **Prof.M.G.Rajamanickam, M.Ch., (Urology), Prof.P.Vairavel, D.G.O., M.Ch., (Urology)**, for their valuable guidance, and encouragement in preparation of this dissertation.

I am very much grateful to **Prof.N.MUTHULATHA, M.Ch., (Urology)**, for her valuable advice, guidance and support in preparing this dissertation.

I am very much grateful to **Dr.P.LEELAKRISHNA, M.Ch., (Urology)** for his valuable advice and guidance.

My sincere thanks and gratitude to **Dr.R.JAYAGANESH, M.Ch., (Urology)** for his constant advice and guidance provided during this study.

I am very much grateful to **Dr.G.SIVASHANKAR, F.R.C.S, M.Ch., (Urology)** for his valuable support and guidance.

My sincere thanks and gratitude to **Dr. A.SENTHILVEL, M.Ch., (Urology)** for his valuable support and guidance.

My sincere thanks and gratitude **Dr.T.SRIKALA, M.Ch., (Urology)** for her valuable guidance.

I thank all my colleagues and staff members helped me in all possible ways.

My sincere thanks to all our patients for their cooperation in conducting the study.

CONTENTS

INTRODUCTION

Almost all injuries of the posterior urethra in the male occur in conjunction with fracture of the pelvis.

In modern civilian society 90% of pelvic fracture injuries caused by motor vehicle accidents involving automobiles, motorcycle riders or pedestrians.

Falls from height, Industrial crushing injuries and sporting accidents make up other 10% of cases.

10% pelvic fracture patients have associated urethral injuries.

90% urethral injury patients have associated pelvic injuries.

Most of the pelvic injuries and associated urethral injuries occurs in younger individuals and associated with significant morbidity and mortality. Mortality rate from pelvic injuries are 14%.

Mortality is mainly due to hypovolemic shock.

The concept of trauma centre was established in our Govt Royapettah hospital in 1970's. Our urology department was established 1n 1972.We have trauma centres at both our institutes,Govt Royapettah hospital and Kilpauk medical college hospital with well experienced teachers and faculty.

We have 30 yrs of experience in managing PFUDD'S and we do all types urethroplasty. We get lot of reference from other peripheral hospital also.

HISTORICAL REVIEW

Primary suture of torn ends of the urethra - Young ,1929.

Suprapubic tube placement and delayed repair – Johanson

The history and evolution of use of transpubic approach for posterior urethroplasty in patients with PFUDD'S can be summarized in two different periods.

1962 –Pierce described exposure of posterior urethra by total abdominal pubectomy.later it was abandoned because of post operative problems & failures.

1973 – Paine and Coombs – Direct Transpubic excision of the stricture and end to end anastomosis by single abdominal incision.

1973 – Water house –new approach using perineo abdominal progressive approach. Perineal incision for mobilization anterior urethra and abdominal incision for Transpubic anastomosis.

1976 –Turner –Warwick suggested using an omental wrap to provide a vascular and trophic support to transpubic anastomosis.

1970's perinio abdominal progressive approach became the gold standard for PFUDD'S.

1986 – WEBSTER and GOLD WASSER - Perineal urethroplasty by transpubic wedge excision of the pubis.

1985 – Pierce also described similar wedge excision of pubis.

Webster and Ramon - Elaborated perineal approach, ancillary maneuvers (separation of corporal body, inferior pubectomy, rerouting of urethra around corpora cavernosa).

1990 –Elaborated perineal approach became the gold standard for the treatment of traumatic posterior urethral stricture.

Although pelvic fracture constitute only 5 to 8% of skeletal injuries, pelvic fracture urethral distraction defect are not uncommon.

AIM OF THE STUDY

1. To analyze causes of Pelvic Fracture Urethral Distraction Defect(PFUDD'S).

2. To asses various definitive management procedures of PFUDD'S.

3. To discuss the factors which decide selection of procedures in PFUDD'S.

4. To analyze complications associated with PFUDD'S and its management.

5. To analyze the outcome of surgical procedure for post traumatic urethral stricture.

REVIEW OF LITERATURE

ANATOMY OF THE PELVIS

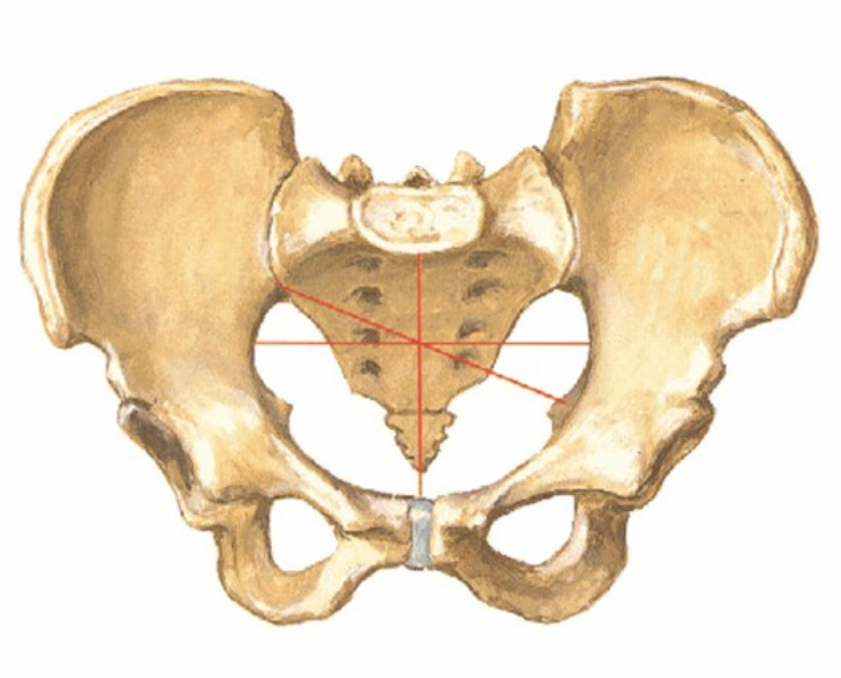
True anatomical pelvis is a formidable protective structure. The pubic arch and symphysis pubis are anterior,the iliac bones are lateral and the sacrum and sacroiliac joint are posterior.

JOINTS OF PELVIS

Sacroiliac joint, Sacrococcygeal joint, Pubic symphysis.

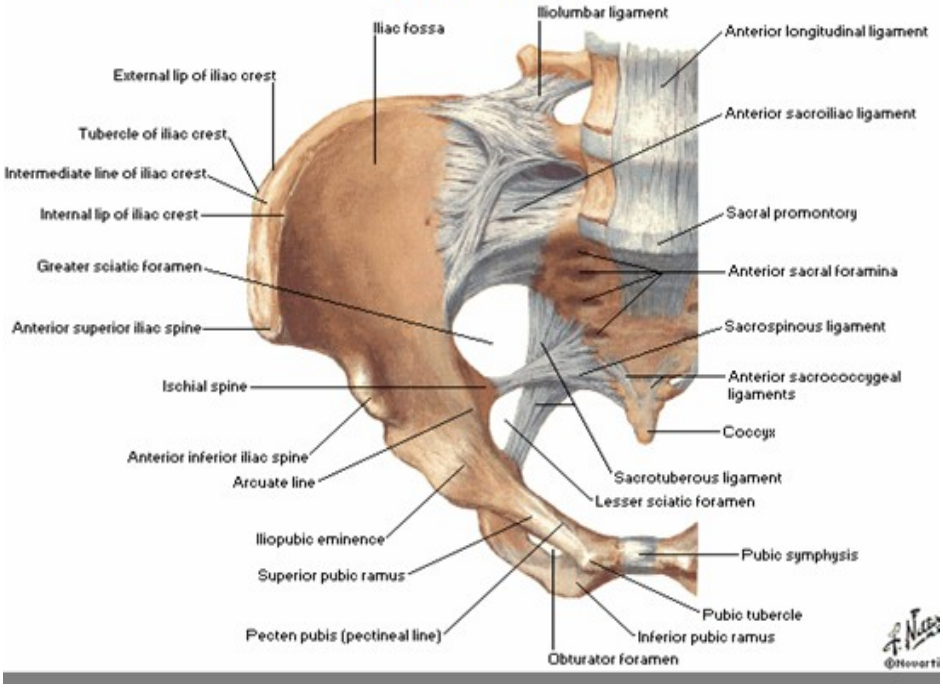
LIGAMENTS

Sacrotuberous, Sacrospinous , Iliolumbar



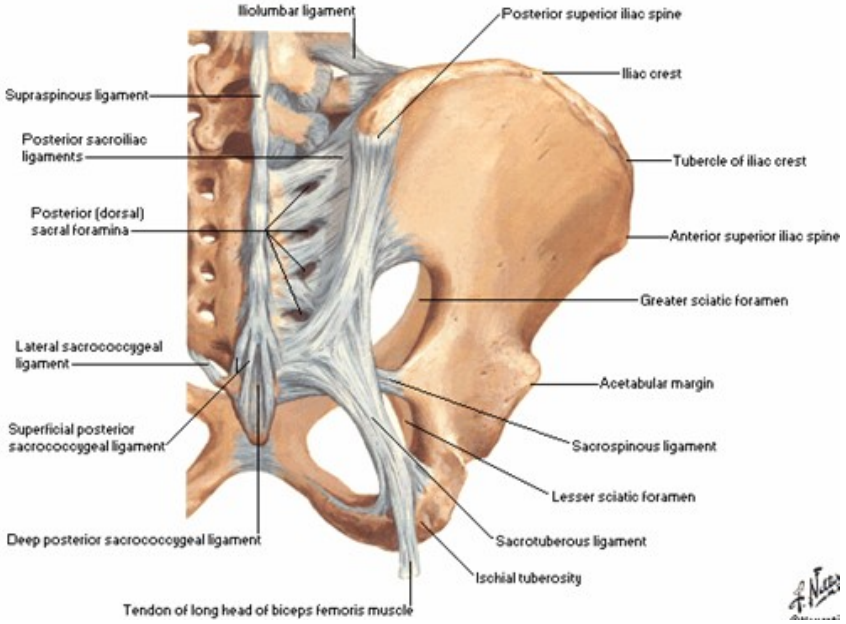
Bones and Ligaments of Pelvis

Anterior View



Bones and Ligaments of Pelvis

Posterior View



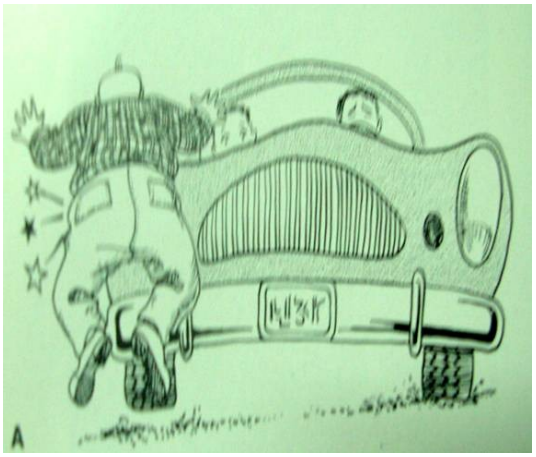
Classification of pelvic injuries (TILE MODIFIED PENNAL ET AL)

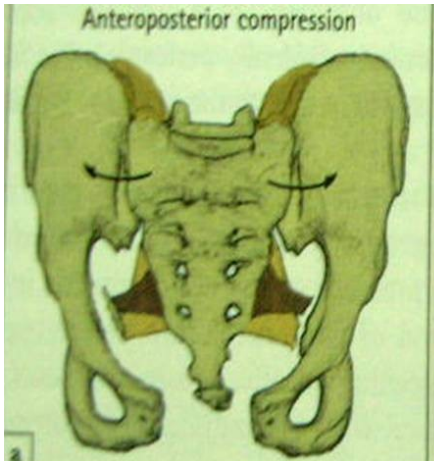
Type A –Stable

Type B -Rotationally unstable but vertically stable

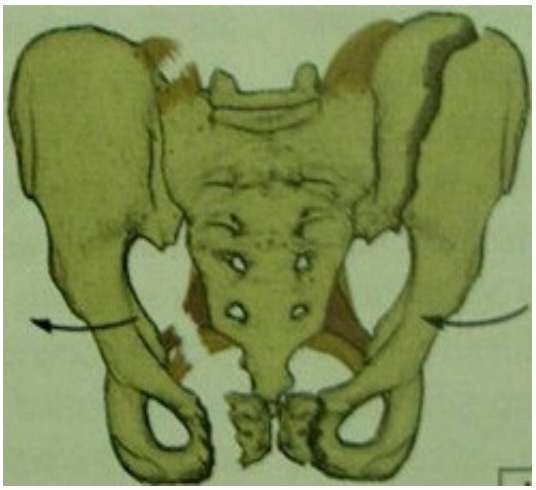
Type C - Rotationally vertically unstable

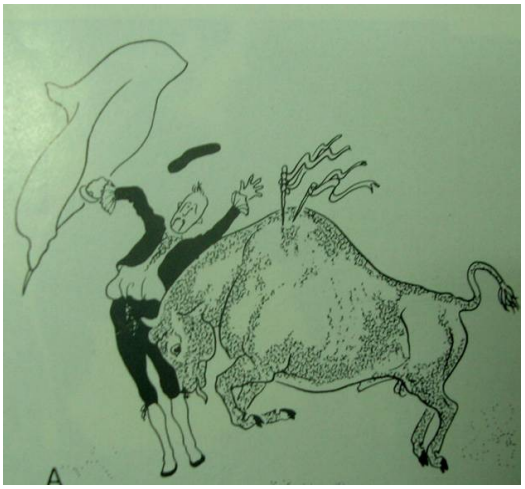
Antero posterior compression (Open Book Type)



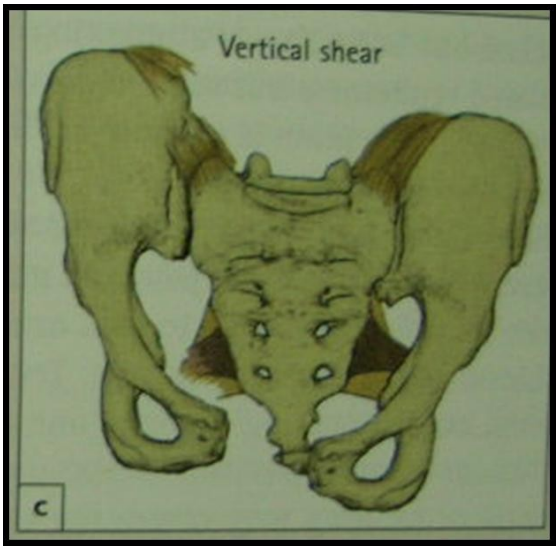


Lateral compression injury





Vertical Shearing injury



ANATOMY OF URETHRA

Understanding urethral injuries begins with a detailed Comprehension of urethral anatomy. Male urethra is divided into six separate areas: 1) **Fossa Navicularis** is contained within the spongy erectile tissue of the glans penis and terminates at the glans. This portion of the urethra is lined with stratified squamous epithelium.

2) **Penile or pendulous urethra** lies distal to the investment of ischiocavernousus muscle, and is invested by corpus spongiosum and maintains constant lumen size roughly centered in the corpus spongiosum.The pendulous urethra is lined with simple squamous epithelium.

3) **The bulbous urethra** is covered by midline fusion of the ischiocavernosus musculature and is invested by bulbospongiosus muscle of corpus spongiosum. It becomes larger and lies closer to the dorsal aspect of corpus spongiosum exiting from its dorsal surface

before the posterior attachment of the bulbospongiosus to the perineal body. The bulbous urethra is distally lined with squamous epithelium that gradually changes to transitional epithelium found in the membranous urethra as it swings upward. [Devine PC and Horton, 1977].

4) **Membranous urethra** is the portion that traverses the perineal pouch and is surrounded by external urethral sphincter. This segment of the urethra is unattached to fixed structures has the distinction of being only portion of the male urethra not invested by another structure, and is lined with delicate transitional epithelium.

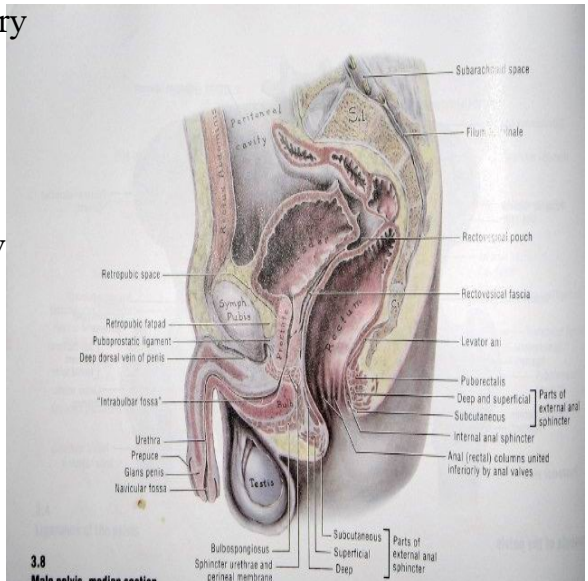
5) **The prostatic urethra**, in common use, is the portion of the urethra that is proximal to the membranous urethra and is mostly surrounded by the prostatic stromal and glandular tissue. Its epithelium is continuous with that of the trigone of the bladder.

6) **The bladder neck** is the location of the bladder neck musculature, variably surrounded by intravesical portion of the prostate. Its epithelium is contiguous with that of the trigone of the bladder.

Blood supply

Arterial blood supply;

- Internal pudendal artery
- Bulbourethral artery
- Common penile artery
- Circumflex artery



- Cavernosal artery
- Dorsal artery

Venous drainage

- Periurethral vein
- Crural vein
- Cavernosal vein
- Superficial dorsal vein
- Circumflex vein
- Deep dorsal vein

Nerve supply

The nerves of the penis are derived from the pudendal and cavernosal nerves.The pudendal nerves supply somatic motor and sensory innervation to the penis.The cavernosal nerves are a combination of parasympathetic and visceral afferent fibers and constitute the autonomic nerves of the penis.These provide the nerve supply to the erectile apparatus.

The pudendal nerves enter the perineum with internal pudendal vessels through the lesser sciatic notch at the posterior border of the ischiorectal fossa.They run in the fibrofascial pudendal canal of Alcock's canal as the first branch of the pudendal nerve.Travelling ventral to the main pudendal trunk above the internal obturator and under the levator ani,the dorsal nerves perforate the transverse perinei muscles to attain the dorsum of the penis and continue distally along the dorsolateral penile surface lateral to the dorsal artery.On the shaft ,their fascicles fan

out to supply proprioceptive and sensory terminals in the skin.These nerves terminate in the glans penis.

The autonomic innervation of the pelvic organs and external genitalia arises from the pelvic plexus.The plexus is formed by preganglionic parasympathetic visceral efferent and afferent fibers arising from the sacral center(S2 – S4) and sympathetic preganglionic afferent and visceral afferent fibers arising from the tharacolumbar center(T11 – L2).Beyond the prostate , the parasympathetic nerves,cavernosal nerves,run adjacent to and supply,Cowper's gland,before entering the corpora cavernosa – where they are readily identified in the hilum of the penis , dorsomedial to the cavernosal arteries.

PATHOGENESIS OF URETHRAL INJURY IN PELVIC FRACTURE

True anatomic pelvis represents a formidable protective structure that must be disrupted before posterior urethra can be injured by external trauma.the pubic arch and symphysis pubis are anterior,the iliac bones are lateral,and sacroiliac joint are posterior.

Pelvic fracture can be classified into stable or unstable.

Stable fracture

1. Involve 3 or 4 ischiopubic rami only,
2. Isolated fracture iliac bones,
3. Avulsion fracture of at insertion of muscles
4. Sacral fracture.

Unstable fracture

4 ischio pubic rami or the posterior as well as anterior pelvic ring fracture.

according to direction of force of injury,

1.Anteropoterior compression-stable or unstable,

2.Lateral compression with or without rotation – stable or unstable,

3.Vertical shear-unstable.

Straddle fracture is 4 rami fracture usually caused by lateral compressive force and rarely by anterior compression injury.

Malgaigne fracture anterior through the ipsilateral ischiopubic rami or symphysis pubis and associated with massive disruption through the sacrum, sacroiliac joint or ilium. The force is through vertical shear.

Since inclination of pelvis to the vertical plane is 40 degrees, vertical shear must result in posterior as well as upward displacement of the affected hemipelvis.

Vertical shear fracture is associated with a relatively high morbidity and mortality.

Risk factors

For urethral injury in association with pelvic injury are

1. Age
2. Sex
3. Type of fracture

In males 10% patients with pelvic fracture sustain urethral injury.

In females, the **risk low** because of

(a) Short length of urethra, (b) Relative mobility, (c) Absence of rigid attachment to the pubis.

In children of < 15 yrs high risk of urethral injury **(56% vs 24%)**. In adults low risk fracture more common compared to high risk fracture **(76% vs 44%)**. Few studies are available which correlates the risk of urethral injury with the types of pelvic fracture.

High Risk

Risk of urethral injury is more

1. Straddle injury with diastasis of sacroiliac joint
2. Bilateral pubic rami fracture Malgaigne fracture

Low risk

Single and ipsilateral rami fracture.

No risk

Isolated fracture of acetabulum, ilium and sacral fractures Pathophysiology and location injury.

The ruptured bone fragment against membranous urethra, Distraction defect of posterior urethra are always a result trauma associated with pelvic fracture.

Pokorny and colleagues proposed four mechanism of Injury to the posterior urethra.

1. The most frequent mechanism is diametric or malgaigne's fracture.

This type of fracture is the result of force applied over the femur.

The upward displacement of symphysis pubis provokes rupture of puboprostatic ligament and can stretch the membranous urethra to the point of rupture.

2. The second mechanism postulated is the bilateral fracture of both superior and inferior pubic rami ,leading to posteroinferior displacement of the ruptured fragment against membranous urethra,thus perhaps causing the bone fragment to act as a guillotine.

3. Third mechanism involves diastasis of the symphysis pubis with rupture one puboprostatic ligament,thus tearing peineal membrane from opposite bone

4. Fourth mechanism speculates a direct injury to the posterior urethra by a spicule of the fractured pubis close to the midline.

Traditionally the location pelvic fracture urethral distraction has been described as being at prostatomembranous urethra.

However many articles in the literature suggest that the most frequent site distraction is the bulbomembranous junction.

Mechanism of urethral injury

Urethral rupture occurs in men at prostate membranous junction by a shearing force, which may avulse the apex of the prostate from the urogenital diaphragm.

Recent studies have demonstrated no distinct superior membrane of urogenital diaphragm separating sphincter muscle from prostate. The urethral sphincter is not a horizontal plane associated thorough out with the prostate. whereas muscles lining and surrounding the membranous urethra are directly continuous with similar muscles of the prostatic urethra.they end abruptly at perineal membrane and are not at the bulbar urethra, hence it is not

prostatomembranous but rather bulbomembranous junction which is the weak spot at which the posterior urethra is liable to rupture.it is noteworthy that in urethral strictures which complicate pelvic fracture the fibrous process consistently involves the membranous as well as proximal bulbous urethra which was the site of original rupture.

With any major force causing pelvic fracture the pelvis is compressed and the soft contents, including the bladder and the prostate are squeezed because the membranous urethra is fixed to the tough perineal membrane which is attached firmly to pubic arch and conversely, the bladder and the prostatic base are loosely attached to bony pelvis, the only way for the squeezed prostate to go is upward.

The membranous urethra is stretched necessarily cephalad because sudden and severe stretch and strain.

Stretching may be of considerable length due to the high elasticity of the membranous urethra if concomitant stretched puboprostatic ligaments are disrupted.

However if maximal elasticity is reached and the force of trauma continues, the urethra will be disrupted partially or completely at fixed and frail bulbomembranous junction.

After complete rupture the prostate will be displaced upwards with loss of urethral alignment.

Disruption of the periprostatic venous plexus, resulting in a large hematoma which frequently displaces the prostatic gland cephlad and posterior, is associated with pelvic fracture.

CLASSIFICATION OF POSTERIOR URETHRAL INJURIES

Posterior urethral injuries may be complete or partial rupture. When the urethra is transected with no trace of continuity between two ends, it is complete. When a full thickness tear involves only part of urethral circumference it is partial. When contusions or lacerations are not full thickness it is incomplete.

Colapinto and McCallum classification (1977)

This classification uses radiographic findings to sort blunt urethral injuries by following types;

Type I –The posterior urethra is stretched but remains intact

Type II – Membranous urethra is partially or completely ruptured at the upper aspect of urogenital diaphragm(supradiaphragmatic rupture) with extravasation into the pelvis. (type1&type2 -10 to 15%).

Type III – The urogenital diaphragm is disrupted,usually completely rupturing the membranous urethra within it with injury to proximal bulbous urethra as well(sub diaphragmatic rupture) -66 to 85% .

Type IV - Injuries of the bladder neck and prostatic urethra.

Type V - pure anterior urethral injuriy.

More integrated concept considers all types of pelvic fracture urethral injuries merely as successive stages of the same insult.

Injuries proximal to the membranous urethra, including those to the bladder neck and prostatic urethra, occur only in children.

Posterior urethral injury - diagnosis

Clinical aspects

Urethral injury should be suspected in the presence of suspected or confirmed pelvic fracture.

The signs of urethral injurirs are Blood at the meatus – 37 to 93 % of cases. Blood at the meatus does not correlate with severity of the injury. Distended bladder, Inability to void, Perineal eccymosis and Perineal bruising.

Digital rectal examination – elevated or displaced prostate gland -34 % of cases, Prostate may be impalpable secondary to surrounding hematoma.

Blood on examining finger highly suggest rectal injury. The triad of prostate membranous urethral disruption are pelvic fracture, blood at the meatus, and inability to void.

Radiographic aspects

RETROGRADE URETHROGRAM

Retrograde urethrography has become study of the choice in diagnosing urethral injuries. It is accurate,simple and may be rapidly performed in the trauma setting.

POSITION

Supine with pelvis is elevated to 30- 45 degree elevation oblique to horizontal position. The thigh closest to table is flexed 90 degree, where the upper thigh is kept straight.

This position allows clear,

a. Visualization of entire urethra

b. Should prevent the pelvic bones from obscuring any extravasation.

Scout film – confirm correct positioning before urethrography.

Positioning may be limited by pelvic fracture.

Technique

14 fr foley catheter is introduced into navicular fossa with balloon inflated to 2cc to seat the tip and to prevent contrast from leaking out the meatus.

The catheter is then connected to a 60 cc catheter syringe with filled contrast material, then 30cc of contrast material is injected into the urethra. A single x-ray is taken towards the end of the injection. This method permits adequate visualization of urethra and detects any extravasation of contrast material.

Ideally it should be done under fluoroscopic guidance but it is not absolutely necessary for diagnostic purposes.

Normal retrograde urethrogram a smooth and continuous contour will be seen through the bulbous urethra.

The contour typically cones down at the bulbomembranous junction.

The normal prostatic urethra appears as anarrow passage with visible indentation by the verumontanum.

An adequate retrograde urethrogram includes a jet of contrast passing through the bladder neck into the bladder.

INITIAL MANAGEMENT

Management of posterior urethral injury should minimize the chances for the debilitating complications of:

1. Incontinence,
2. Erectile dysfunction,
3. Urethral stricture,
4. Avoid infecting or opening of pelvic hematoma.

Ideal method of management is controversial

Depend on the timing of intervention, the treatment is classified into

1.Immediate

< 48 hrs of lnjury

2.Delayed primary

2 to 14 days of of injury,

3.Deferred

3 months or more after injury

The ideal method management is controversial.

The question is on the etiology of the posterior urethral injuries is whether subsequent sequela from urethral injury is result of primarily of the injury or due to management.

Techniques of yester year, open primary urethral repair and “rail roading’’ are excluded, contemporary series on posterior urethral injury give clear support that the etiology of urethral injury complications are due to injury itself.

Complications of initial injury

Hemorrhage, hematoma, hematoma – fibrosis

All pelvic fracture injuries result in pelvic floor hematoma.

The size of hematoma varies from minimal to massive and lethal.

If the pelvic fracture is associated with urethral distraction injury, even a small hematoma – fibrosis may critically complicates its surgical resolution.

If there is no coincident lower urinary tract injury, even an extensive eventual pelvic hematoma fibrosis from pelvic fracture injury is little or no clinical consequence.

SIMPLE & COMPLEX ;

SIMPLE;

The commonest end result of subprostatic urethral injury is short prostatobulbar urethral gap associated with a minimally extensive hematoma fibrosis. This can be treated by simple perineal anastomotic urethroplasty.

COMPLEX

1. Extensive retropubic hematoma fibrosis
2. A long prostate bulbar urethral gap
3. Side tracking false passages into retropubic or osteomyelitic cavities
4. Fistulae into rectum, bladder base, the perineum, or the suprapubic area.
5. Coincident incompetence of the bladder neck sphincter mechanism secondary either to intrinsic damage or incarcerating hematoma fibrosis.

Sphincter mechanism injury and urinary incontinence

The whole length of the posterior urethra, from the internal meatus to the membranobulbar junction, is sphincter active.

There are two independent sphincter mechanisms proximal and distal to the verumontanum-normally.

Each of these is competent independently capable maintaining continence in the absence of other provided it has sustained no injury.

When the distal sphincter is destroyed by a subprostatic urethral distraction injury, continence is dependant on bladder neck mechanism.

Although a distraction defect almost always result in functional incompetence of intrinsic distal urethral sphincter, on evaluation by voiding cystourethrography this deficiency is sometimes masked because of an intact pubo urethral sling element of the pelvic floor levator diaphragm can achieve a stop – test occlusion of the voiding stream.

Incompetence of bladder neck mechanism

Male bladder neck mechanism is generally reliably competent unless it is rendered incompetent by unstable detrusor contractions.

Bladder neck sphincter mechanism is not usually damaged by the pelvic fracture injury.

When fracture results in wide symphysial diastasis in children, there is a possibility of damage to bladder neck mechanism.

The commonest cause of incompetence of the bladder neck after pelvic fracture injury is the circumferential tethering of an uninjured mechanism by the natural shrinkage-replacement of an extensive pelvic floor hematoma by hematoma –fibrosis.

By removing the dense anchoring retropubic fibrosis anteriorly, the bladder neck functional mechanism can be restored.

The reliability of this procedure is dependant on preventing the complication of secondary fibrotic reimmobilization by occluding the consequent paraprostatic dead space cavity with a supple omental pedicle graft,which ensures the continued functional mobility of the sphincter mechanism.

Erectile dysfunction

Erectile dysfunction is a major and a disastrous complication of pelvic fracture injuries.

It can occur in the absence of urinary tract injury, but the incidence is higher when sub-prostatic urethra is ruptured and higher still when this is associated with a major prostate-vesical dislocation.

There are 3 separate and independent functions namely–erection, ejacualation and achievement of orgasm.

The sensation of orgasm is rarely damaged by pelvic fracture injury, and ejaculation is commonly bestowed,after reconstitution of urethral continuity.

The great majority of patients experience failure of erection mechanism for days sometimes weeks after a pelvic fracture injury but most recover satisfactory erections some after a year or more after there injury.

The erection failure is much more commonly the result of neural damage than the vascular insufficiency owing to the course of Nervi erigentes and their proximity to the sub-prostatic urethra, it is probable that almost every pelvic fracture urethral distraction injury results in some damage to the neural elements of the erection mechanism. This is sufficient to cause complete erection failure in about 20% of these cases but some degree of impairment is much commoner.

Any local operation immediate or deferred, in the area of sub-prostatic urethral injury must carry some risk of critically extending the primary local neuropathy associated with it

particularly if it involves resection or separation of tissue in the area of Nervi erigentes postero-lateral to the sub-prostatic urethra.

Hence during surgery one should avoid mobilization retroprostatic tissue plane to avoid injuryto neurovascular bundle.

However the normal posterolateral anatomic relation of the neural pathway to the subprostatic urethra is often grossly distorted by severe urethral distraction injuries and furthermore, they secondarily incarcerated by scar tissue or hematoma fibrosis.

Even if direct injury can be avoided by an anterior approach, a secondary distortional effect could be critical when a mechanism is precariously innervated.

The incidence of secondary impotence after a delayed anterior approach repair is very low when fully functional erection mechanism has survived the initial accident.

Occasionally an impaired mechanism is critically affected by any local surgery.

Role of catheterization

Unless otherwise contraindicated,a foley catheter inserted during resuscitation

1. To relieve urinary retention,
2. To decompress the bladder before abdominal exploration
3. To monitor urine output as an indicator of adequate resuscitation

When urethral injury is suspected catheterization is discouraged to prevent

1.Potential conversion of partial into complete urethral injury

2.Infecting the pelvic hematoma.

Nonetheless, one gentle attempt to place a foley catheter in partial disruption is reasonable.

Immediate surgical repair

Primary suturing of severed urethral ends, once commonly performed, has been abandoned, because of high rate of complications,like post operative impotence (56%), Incontinence (21%), Compared with deferred treatment, stricture is less common.

Incontinence is 5 times, Impotence is 3 times worse in primary surgical repair. Other problems with primary repair are potential release of primary hematoma tamponade (risking uncontrolled bleeding), Excessive urethral debridement and subsequent stricture (technically demanding), Converting an incomplete to complete urethral injury during dissection.

Urethral catheter traction was also in practice,abandoned due to complication, thought to cause tissue ischemia of the sphincter and bladder neck or to the prostate being pulled in abnormal position when the urogenital diaphragm was injured also.

Deferred treatment

After abandonment of immediate primary repair 1970's, suprapubic urinary diversion followed by delayed primary repair has been accepted as general standard of care.

In acute trauma setting, when the urethra is injured and the bladder is distended, suprapubic tube usually can be placed percutaneously.

- Clear urine on SPC suggest no major bladder injury.

- When gross hematuria is there, cystogram should be performed.

When the bladder is empty (from recent micturition or concomitant bladder or bladder neck injury), the suprapubic tube is placed by open cystotomy. Avoid the perivesical /retropubic fascial planes so as not disrupt the pelvic hematoma.

The bladder is entered at the cephalad aspect of the dome. The bladder is explored for concomitant bladder injuries. Extraperitoneal injuries are closed with absorbable sutures from within the bladder.

Prevesical drains are not used because they may increase the potential for pelvic hematoma infection Hematoma slowly reabsorbs over next 3 to 6 months,and 1.the prostate descends into a more normal position

Scar tissue at the urethral disruption becomes stable and mature. For complete urethral disruptions, this approach assumes an inevitable urethral stricture and need for delayed urethroplasty or urethrotomy.

The major advantage to deferred treatment is that in exchange for a high posterior urethral stricture rate is a low reported incidence long term impotence or incontinence. Overall complication rates for deferred treatment of posterior urethral injuries are

1. **Posterior urethral stricture(97%),**
2. **Impotence (19%)**
3. **Incontinence(4%)** (Koratim et al)

These values of impotence and incontinence can be used as the gold standard for which all other interventions are compared.

Primary realignment

Immediate primary realignment;

1. Stable patient

2. Short urethral disruption defect

When compared with urinary diversion alone. The complication rates

Primary	**realignment**	**Suprapubic diversion**
Incontinence	1%	4%
Impotence	28%	19%
Stricture	53%	97%

Delayed primary realignment

2 to 14 days Multisystem trauma patients, unstable patients Initially SPC, once the patient is stable delayed primary realignment, can be combined with open reduction and internal fixation of associated pelvic fractures complication

Delayed	**realignment**	**Suprapubic diversion**
Incontinence	4%	4%
Impotence	23%	19%

Stricture	53%	97%

Advantage

Stricture management easier later

Less fibrosis

MATERIALS AND METHODS

Our study is a prospective study of post traumatic stricture urethra for the period from September 2005 to April 2008 at our institutions, Govt Royapettah hospital & Kilpauk medical college hospital.

My study consist of about 40 cases from age group of 14 years to 72 years.

INCLUSION CRITERIA;

All cases post traumatic stricture urethra associated with pelvic fracture

EXCLUSION CRITERIA

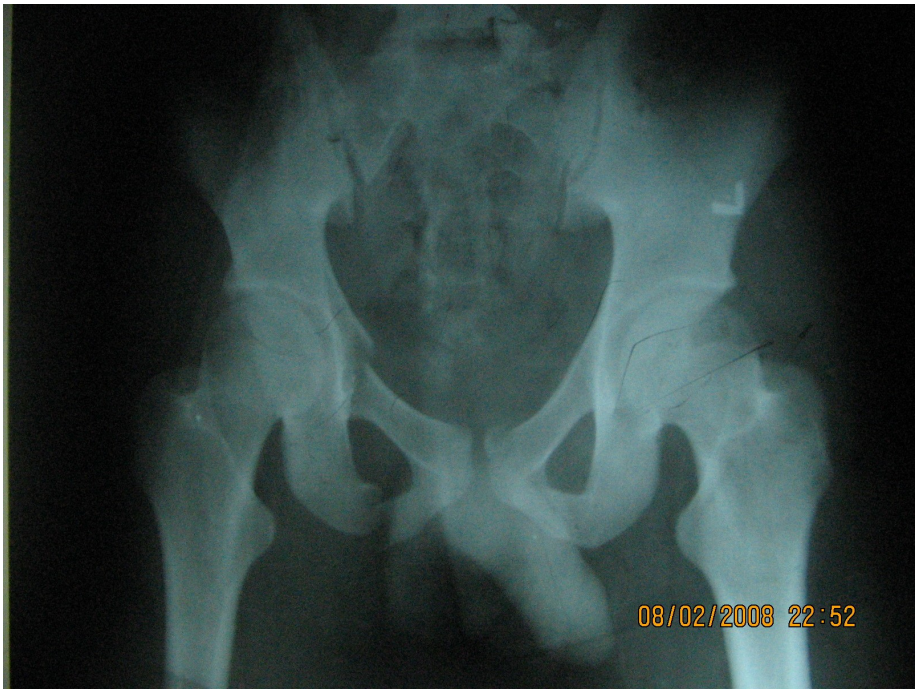
1. Inflammatory urethral stricture
2. Stricture following traumatic catheterization
3. Urethral stricture following surgery – open and endoscopic procedure.
4. Recurrent stricture

EVALUATION AND MANAGEMENT

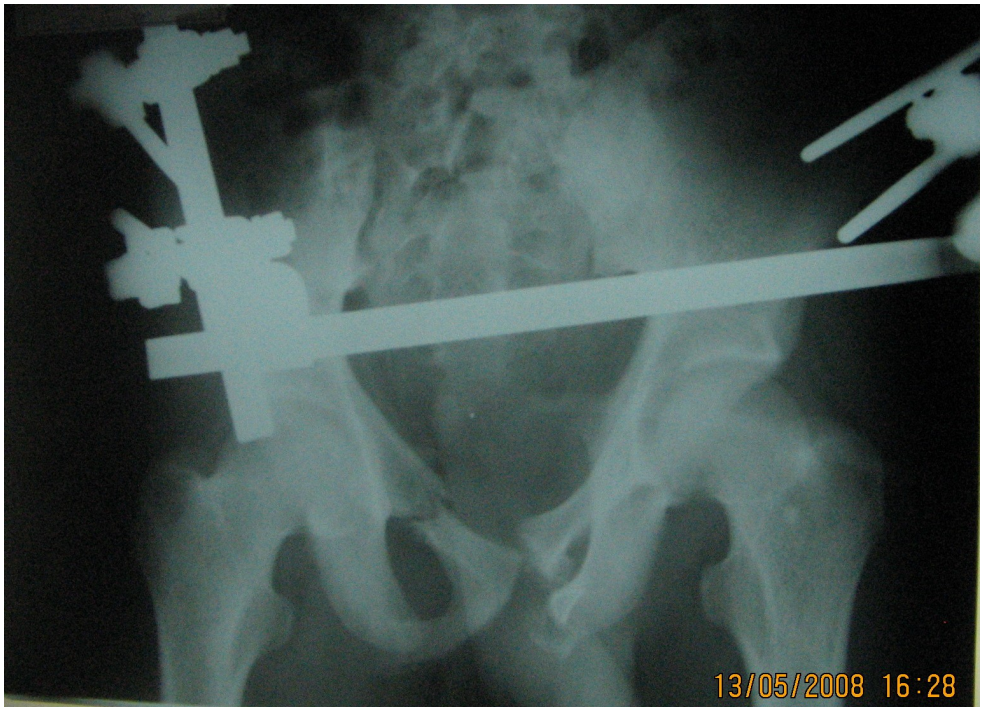
All patients presented to our dept minimum 3 months after injury period range from 3 to 5 months. Only one patient underwent urethroplasty after 7 yrs trauma all patients were with SPC diversion.

Multiple Trauma with Urethral Injuries

Bilateral pubic rami fracture



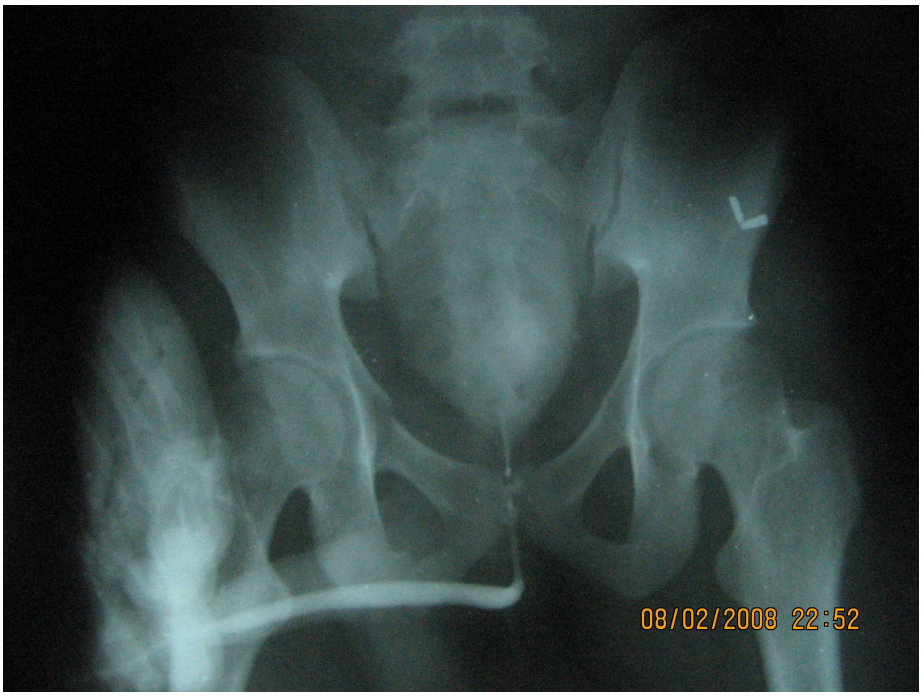
External Fixator



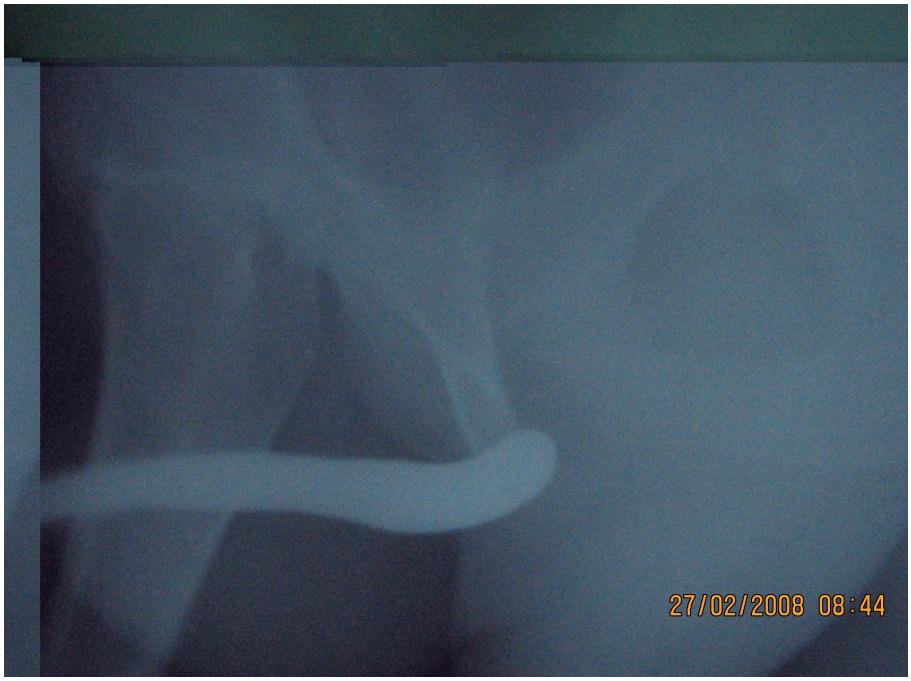
Symphysial Diastasis

RGU – Acute Injury

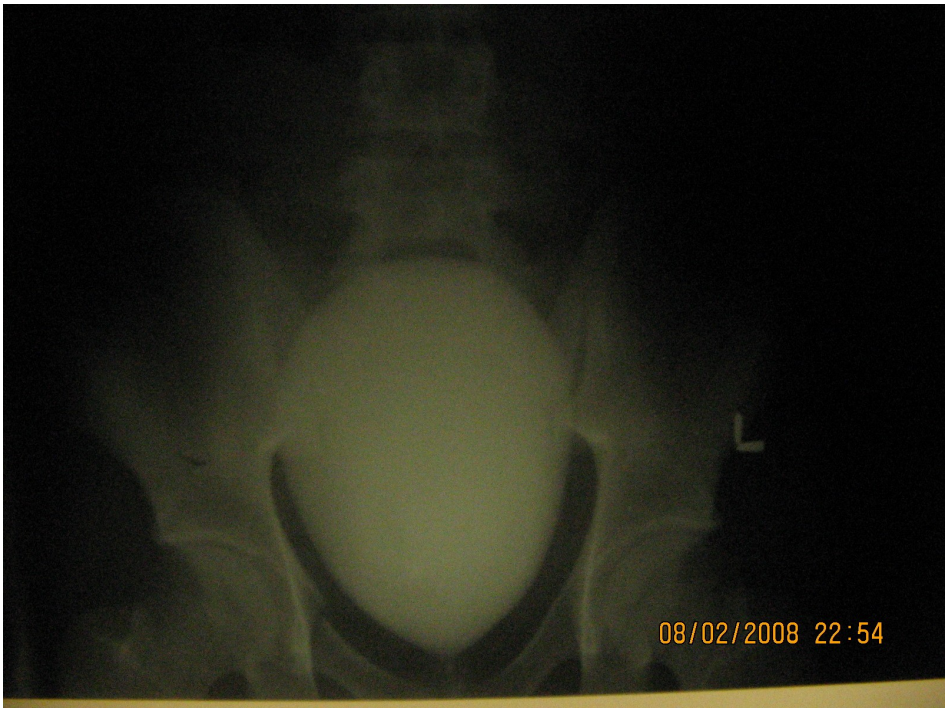
RGU with Fracture Pelvis



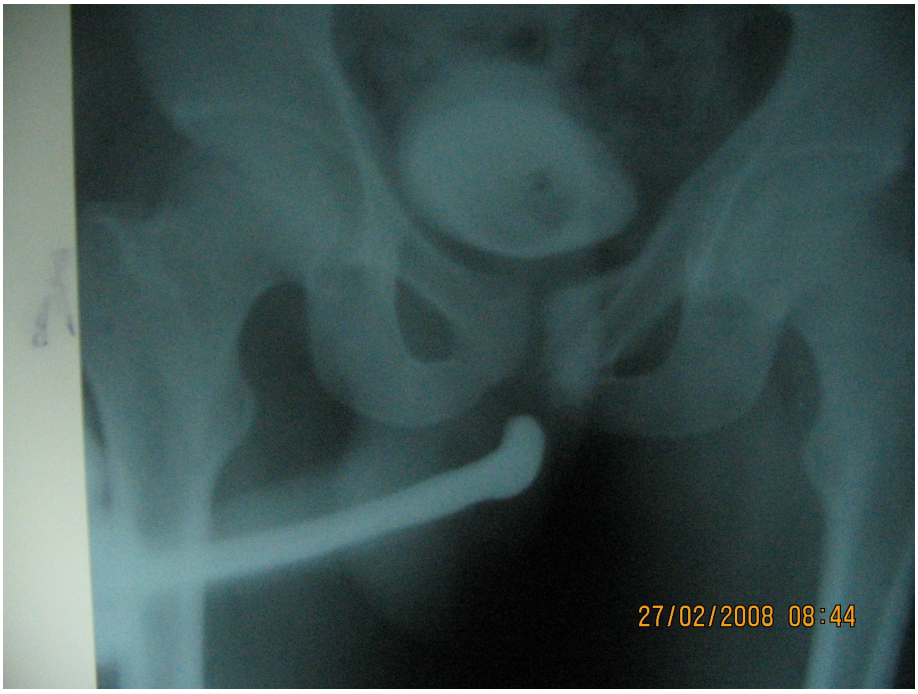
RGU – Before Definitive Repair



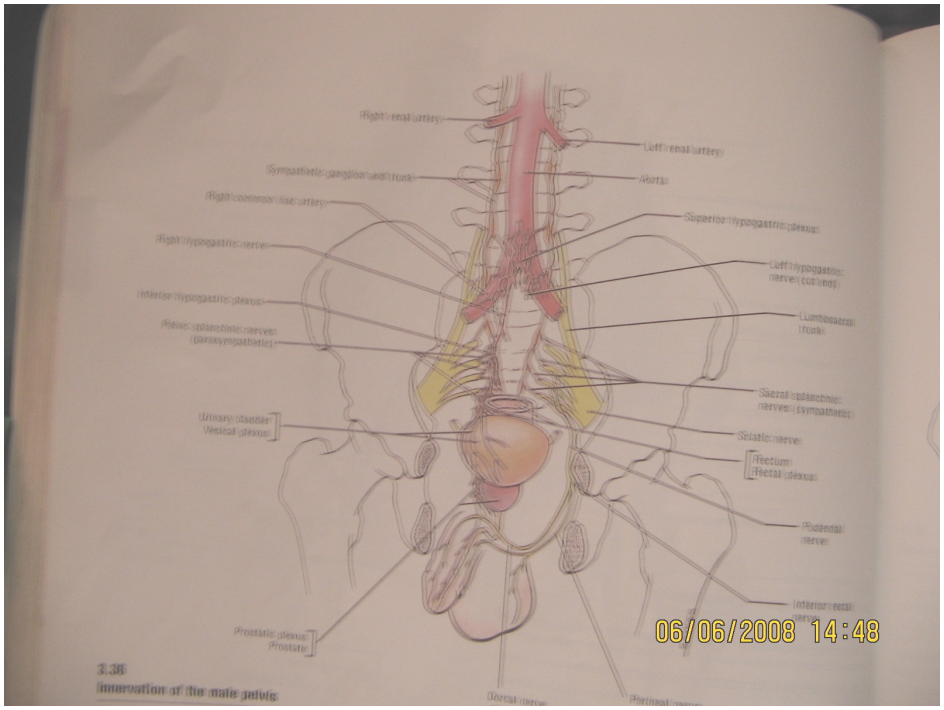
Cystogram

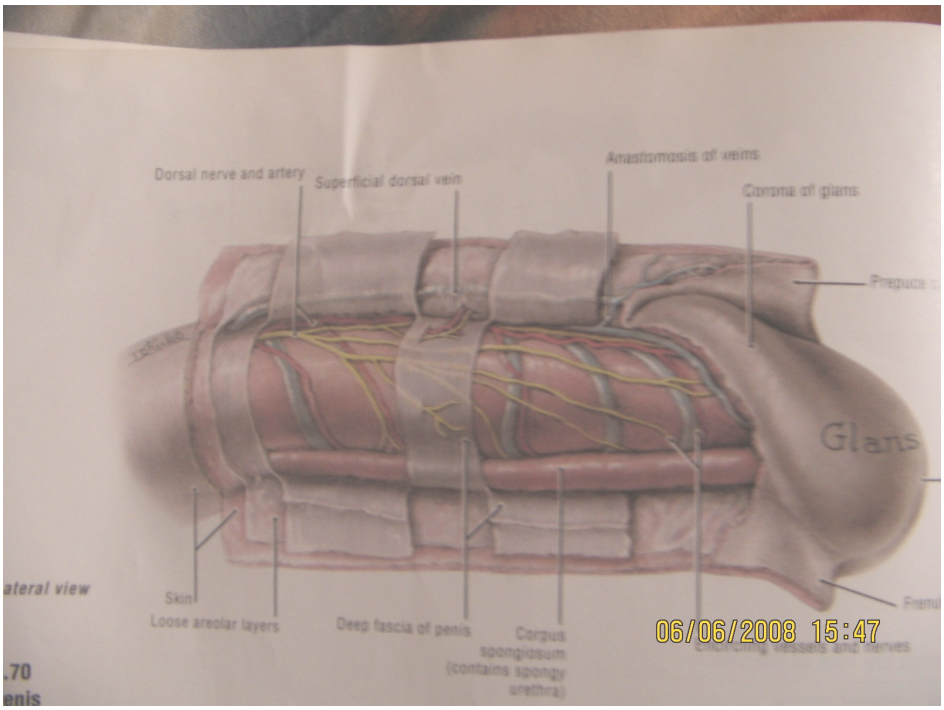


Up and Down O gram



Nerve supply





Blood supply

Evaluation of the patient

1. To asses stricture length
2. To asses the density of the fibrosis
3. To asses bony deformity
4. Overriding pubic bone callus

Initial urethral injury managed by SPC thourough evaluation was done

Urine routine for albumin

Sugar

Deposits

Urine for culture and sensitivity

Blood Hb

PCV

TC

DC

ESR

Blood urea

Serum creatinine

Blood group

Xray KUBU

X RAY PELVIS

Xray chest

ECG

Retrograde urethrogram

VCUG

SP Cystoscopy.

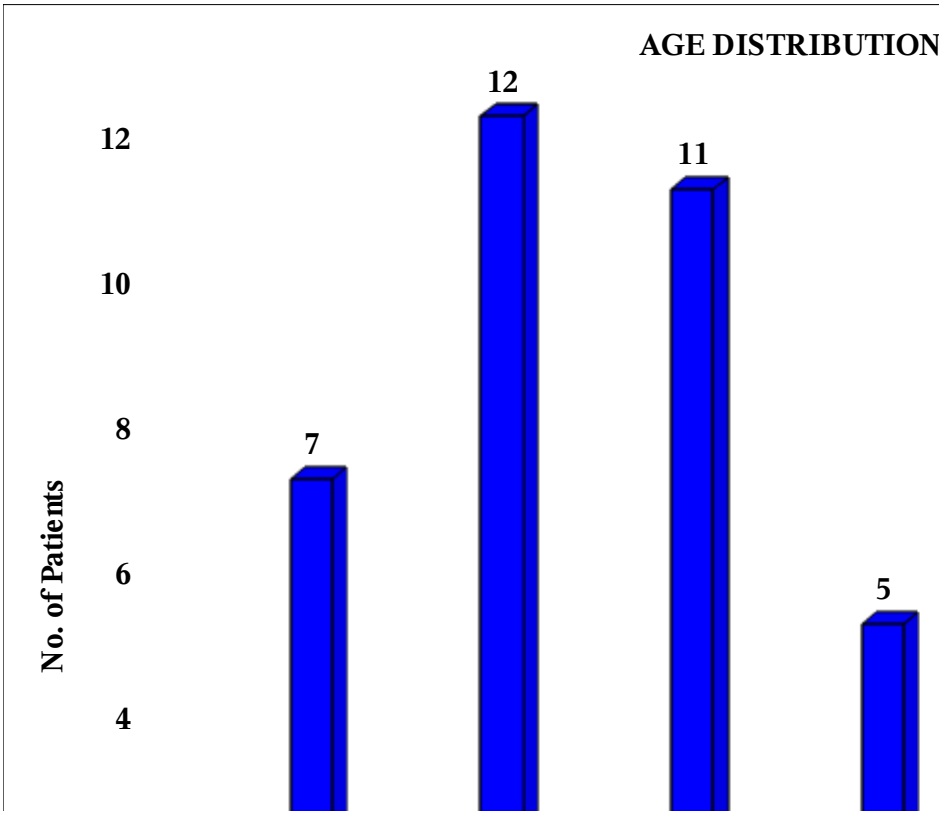
Our study consist of 40 patients with pelvic fracture urethral distraction defects.

All our patients are male .

Patient age ranged from 14 yrs to 72 yrs (mean) with most common age group being 11 to 40 years.

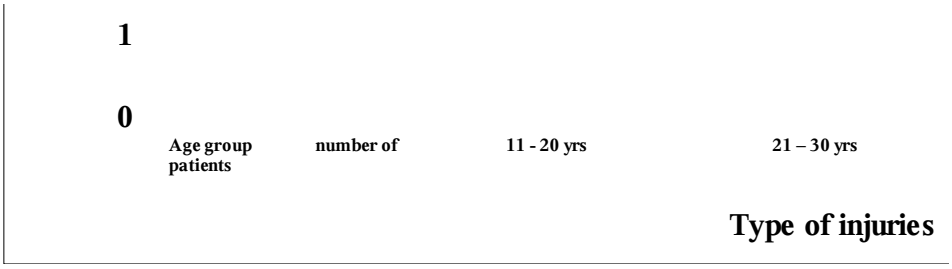
RESULTS AND DISCUSSION

Sl.No.	Age group	No. of patients
1.	11-20 yrs	7
2.	21-30 yrs	12
3.	31-40 yrs	11
4.	41-50 yrs	5
5.	51-60 yrs	2
6.	61-70 yrs	1
7.	71-80 yrs	2

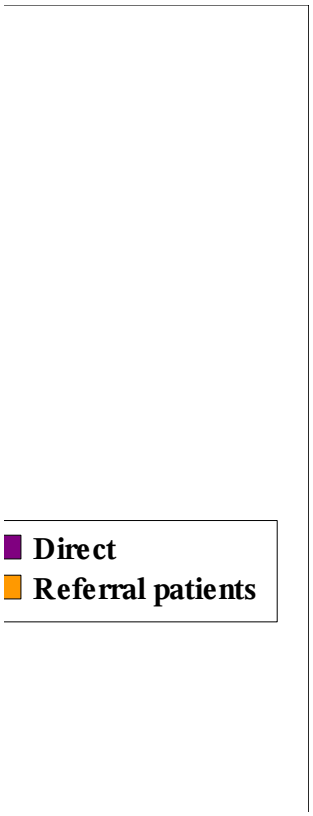


Sl.No.	Mode of injury	No. of patients
1.	RTA (motor vehicle accidents)	14

2.	RTA with direct hit by vehicle on pedestrians	18
3.	Agricultural activities	2
4.	Fall from height	4
5.	Industrial Accident	2
	Total	**40**



Sl.No.	Admission	No. of patients
1.	Direct	30
2.	Referral patients	10
	Total	**40**



Sl.No.	Mode of intervention	No. of patients
1.	Emergency exploration & SPC diversion	5
2.	SPC Diversion alone	25
	Total	**30**

Among 30 patients 5 patients underwent emergency exploration.

Two patients had associated bladder injuries.Bladder injury was repaired and SPC diversion was done.

Two patients had only urethral injuries with huge retropubic pelvic hematoma .They were treated by only SPC diversion and later planned for definitive repair. One had associated bladder and bowel (rectal) injuries.He was treated with bladder repair ,SPC diversion and diversion colostomy.

Sl.No.	Types of stricture	No. of patients
1.	Bulbomembranous	34
2.	Prostatomembranous	6
	Total	**40**

Bladder rupture occurs in 5 to 10 % of pelvic fractures.

Bladder injuries increase upto 10 to 20% when there is associated urethral injuries.

In our study pelvic fracture urethral distraction defect is associated with other pelvic organ injuries in 3 cases out 30 cases. (10%).

- Length of stricture
- In our study the length of stricture varies from 1.6 cm to 3.8 cm.
- Average length of stricture 2.2 cm

PRE OPERATIVE PREPERATION

- Clear liquids
- Daily bath cleaning the perineal area
- Perineal area wash with betadine solution
- Antiseptic irrigation through suprapubic tract
- Pre operative sterile urine culture.
- Pre operative antibiotics

OPERATIVE TECHNIQUE

There are 3 golden triad that assures successful outcome, namely

1.complete exision of scarred tissues,

2.fixation of healthy mucosa of the two urethral ends and

3.creation of a tension free anastomosis.

With the patient in the lithotomy position the perineum and subumbilical regions were prepared and draped as a single operating field.we do use exaggerated lithotomy position some cases.

Retrograde urethroscopy and suprapubic cystourethroscopy.

1. To asses length of stricture,
2. To asses bladder neck
3. To asses the prostatic urethra

4. To asses the verumontanum

Incision

1. Midline perineal incision
2. Separation bulbocavernous muscle
3. Mobilization of urethra
4. Division of urethra
5. Excision of scar tissue
6. Spatulation of proximal and distal urethra
7. Tension free end to end anastomosis
8. Fixation of anastomosed urethra
9. Drain placement
10. Approximation of bulbocavernous muscle
11. Closure of the wound

Steps for additional length of the stricture

1. Complete mobilization of urethra upto penoscrotal junction(suspensory ligament).
2. Division of intercrural septum and separation of corpora cavernosa
3. Inferior pubectomy
4. Corporal rerouting of the urethra

Factors for inappropriate perineal anastomotic repair

1. Long urethral defect
2. Chronic periurethral cavity

3. Fistula
4. Bladder neck incompetence
5. Associated anterior urethral disease
6. Factors limiting surgical access
7. History of previous failed urethroplasty

Management of inappropriate progressive perineal approach

1. Abdomino perineal approach
2. Substitution urethroplasty

POST OPERATIVE MANAGEMENT

1. Drain removal after 48 hrs
2. Mobilsing the patient from bed -2nd post operative day onwards
3. Liquids from 2nd to 4th POD
4. Solid diet from 5th POD onwards
5. Suture removal on 10th POD
6. Pericatheter study – 3rd week,
7. Catheter removal- 3RD week
8. Clamping SPC – 2 weeks after catheter removal

TRANSPUBIC URETHROPLASTY

Bulbar urethra is mobilized and rerouted around a corporal body and passed transpubically. It is anastomosed to the apex of the prostate from the abdominal side. Thus the

original curved course of anterior urethra to the perineum and back to the prostate is circumvented, resulting in short course direct from penoscrotal junction to the prostate. With this maneuver a urethral gap more than 2.5 cm after excising scar tissue and tension free anastomosis is achieved.

ADVANTAGES

Wide and excellent exposure that greatly facilitate disengagement of an incarcerated prostate and suture placement of urethral anastomosis.

Allows synchronous repair bladder neck incompetence and urethral fisrula to the bladder neck or rectum.

It permits use of pedicled omental graft to envelope site of anastomosis and the transpubic part of the bulbar urethra, so that they remain supple and protected from any fibrosis or callus formation.

Shortens the course of the bulbar urethra the distracted upwardly placed prostatic urethra.

Disadvantages

Chronic pain

Gait abnormalities

OPTICAL INTERNAL URETHROTOMY

Useful short stricture, done using 21 fr IU sheath with 0’ telescope, Ureteric catheter guidance, No associated bladder neck injuries, Catheter kept for 1 week after OIU. OIU has limited use in posterior urethral stricture.

Sl.No.	Types of procedure	No. of patients
1.	Optical internal urethrotomy	4
2.	Perineal end to end urethroplasty	30
3.	Transpubic urethroplasty	6
	Total	**40**

Sl.No.	Types of procedure	Complication	No. of patients
1.	OIU 4	Incontinence ED, Restricture	0 0 2
2.	Perineal end to end urethroplasty 30	Incontinence ED, Restricture	0 7 5
3.	Trans pupic urethroplasty 6	Incontinence ED, Restricture	0 3 1
	40		

Sl.No.	Complication	Major	Minor
1.	Wound infection		3
2.	Periurethral collection		1
3.	Shell calculus		3
4.	Incontinence	-	
5.	Erectile dysfunction	10	
6.	Restricture	8	
	Total		

Sl.No.	Auxillary procedure	No. of patients
1.	OIU	4
2.	Visual dilatation	4
	Total	**8**

Sl.No.	Outcome	No. of patients
1	Straddle injuries	28
2	Malgaigne fracture	12
3	Pubic diastasis	2
	Total	**40**

Sl.No.	Procedure	Success	Failure
1	OIU	2	2
2	Perineal end to end urethroplasty	25	5
3	Transpubic urethroplasty	5	1

In our study out of 40 patients, 32 patients were voiding well without any auxillary procedure. 8 patients failed to void satisfactorily, which was corrected by various auxillary procedure like OIU, visual dilatation.

According to MM Koratim et al. the success rate perineal urethroplasty is 95%. For transpubic urethroplasty the success rate is 95-98%.

SUCCESS DEFINITION

- Patient voids well with adequate caliber as before trauma
- Continence and a wide urethra at the site of repair
- No secondary or auxillary procedures needed
- No restenosis

FAILURE

- Not voiding as before trauma,
- Incontinence,
- Narrowing or arrest of contrast medium at the site of repair on urethrography
- The need for repeat dilatation or repeat OIU

DISCUSSION

40 patients were included in our study.

Among them 30 patients came to our hospital directly all the initial management done by us. 10 patients were referred to us for delayed management posterior urethral defect with SPC in situ.

5 patients out 30 patients underwent emergency exploration for other associated injuries. Among them 3 patients had extra peritoneal rupture of bladder which was repaired and SPC was kept.

One patient had interstitial injury (grade III) OF BLADDER and SPC was kept.

All other 25 patients were managed with TROCAR SPC alone was planned for definitive repair afterwards.

Among 30 patients, 8patients underwent stabilization pelvic fracture with fixators.

In our study commonly the younger age group is affected.

75% of affected patient are in the group of 11 to 40 yrs.

RTA is predominant cause for pelvic fracture and urethral distraction defect.

Industrial injuries and other activities related to work site, like construction, agriculture activities are also responsible for remaining 1/3rd of the patients.

Length of the stricture assessed by radiographic contrast method varies from 0.5 cm to3.5 cm.

Average stricture length - 2.3 cm.

Procedure done;

OIU 4 patients, perineal end to end urethroplasty - 30 patients, transpubic urethroplasty - 6 patients. Among 4 OIU patients, 2 patients voided well one required repeated internal urethrotomies. Another patient is on dilatation.

Presence of scar tissue is responsible for restenosis, which require repeat dilatation / internal urethrotomy.

Transpubic urethroplasty was done six patients. Among them 5 patients are voiding normally. Only one patient required visual dilatation twice.

Two had erectile dysfunction prior to the surgery. 2 patients had underwent because of gross distraction with overriding callus bone, 3 patients had long stricture and 1 patient complex fistula. No patient developed incontinence. No deformity on walking.

Among 30 patients who underwent perineal end to end urethroplasty,25 patients voided normally.5 patients required auxillary procedures in the form of repeat dilatation or internal urethrotomy.

Among the 40 patients 32 patients voiding well. 8 patient needed auxillary procedure at the end of 3 months. 2 patients had anastomotic narrowing because incomplete excision of the stricture portion.both of them were treated by OIU.

3 patients had calculus which was treated by endoscopic method. Prolonged SPC drainage, urinary tract infection and diminished water intake are all responsible for stone formation.

Granulation tissue at the site of anastomosis was responsible for difficulty void during post operative period.

Erectile dysfunction was present in 12 patients prior to surgery. Among them 2 patients regained their erectile function following urethroplasty.

The success rate for OIU varies from 50-60%.

In my study the success rate for IS OIU 50%

For perineal anastomotic urethroplasty 80%

For transpubic urethroplasty success rate is 84%

According the literature the success rate for any anastomotic urethroplasty is above 90%.

FOLLOW UP

Follow up period ranges from 3 months to 2½ years.

After catheter removal , urethrocystoscopy is done to asses the urethral anastomotic site.Afterwards follow up is done at 3 months.

Patient is asked about urinary stream,if there is reduction in urinary stream ,patient is evaluated with uroflometry.

If uroflowmetry shows obstructed pattern

Retrograde urethrogram is done.

If it shows anastomotic narrowing intervention is planned with oiu or visual dilatation.

2 patients showed anasmotic narrowing which was treated with OIU.

Other two patients were treated with visual dilatation.

Two patients had calculus .Both of them were managed with endoscopic removal using 25 fr sheath.

Uroflowmetry

Urethrocytoscopy

CONCLUSION

Road traffic accidents is the major cause of pelvic fracture urethral distraction defects in my study.

Pelvic fracture urethral distraction defect significantly affects younger population.

Perineal urethroplasty is the gold standard

Transpubic urethroplasty is a very useful procedure in case complex PFUDD.

There is no significant complications associated with transpubic urethroplasty in experienced centers.

Location of distraction defects

Length of distraction defect

Amount of fibrosis

Presence of callous in between the distracted ends of urethra are the factors which determine the selection of the surgical procedure.

All principles of urethroplasty must be adhered to make urethroplasty as highly successful procedure.

In my study success rate of urethroplasty is 80%.

With auxillary procedures 90 %.

Erectile dysfunction 25%

Incontinence – nil.

ANNEXURE

Patient name: Age: Sex:

Address :

Mode of injury :

Pelvic fracture type :

Direct or referral :

Initial management :

Length of stricture :

Type of procedure :

Treatment out come :

MASTER CHART

1.Gopi 20/m 7975 rta with puts OIU

2.Diloshan 25/m 31489 rta ptus with bladder injuries trans pubic urethroplasty

3.Ayyanar 29/m perineal urethroplasty

4.Mariadoss 18 /m perineal urethroplasty

5.Sachidanandam 72/m rta 4209 perineal

6.Thirumal 40/m 823480 perineal urethroplasty

7.Sadayandi 35/m 827403 perineal urethroplasty

8.Kumar 35/m 828575 perineal urethroplasty

9.Murugan 20/m 830260 perineal urethroplasty

10.Syed basha 70/m 828869 perineal urethroplasty

11.Krishnareddy 34/m 831444 perineal urethroplasty

12.Mani 43/m 836088 perineal urethroplasty

13.Balamurugan 30/m 836693 transpubic urethroplasty

14.Saivaraj 35/m 837795 transpubic urethroplasty

15.Gnanasekar 35/m perineal urethroplasty

16.Parthasarathy 45/m 839770 perineal urethroplasty

17.Ponnusamy 45/m 839774 perineal urethroplasty

18.Muneeswaran 29/m 843250 perineal urethroplasty

19.Jayakumar 13/m 848147 perineal urethroplasty

20.Krisnamoorthy 35/m transpubic urethroplasty

21.Kumar 23/m 857551 perineal urethroplasty

22.Arumugam 50/m 860667 perineal urethroplasty

23.Kumar 48/m 866407 perineal urethroplasty

24.Xavier prabu 15/m866182 perineal urethroplasty

25.Munusamy 35/m869024 perineal urethroplasty

26.Pitchandi 32/m871554 perineal urethroplasty

27.Chinnatambi 60/m 872182 perineal urethroplasty

28.Gopi 26/m 872682 transpubic urethroplasty

29.Srinivasan 28/m 870508 perineal urethroplasty

30.Ravindran 47/m 873209 stricture with fistula repair & perineal urethroplasty

31.Kumar 45/m 873780 OIU

32.Thirupal 36/m 878630 perineal urethroplasty

33.Upendra kumar singh 36/m 881311 perineal urethroplasty

34.Shunmugam 52/m 885597 perineal urethroplasty

35.Kasi 45/m887104 perineal urethroplasty

36.Rajini 24/m 891458 perineal urethroplasty

37.Prabakaran 20/m transpubic urethroplasty

38.Bhaskar 24/m OIU

39. Kumar 17/m OIU

40. Raja 21/m OIU

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